The American Biology Teacher

VOL. 1 DECEMBER, 1938 NO. 3

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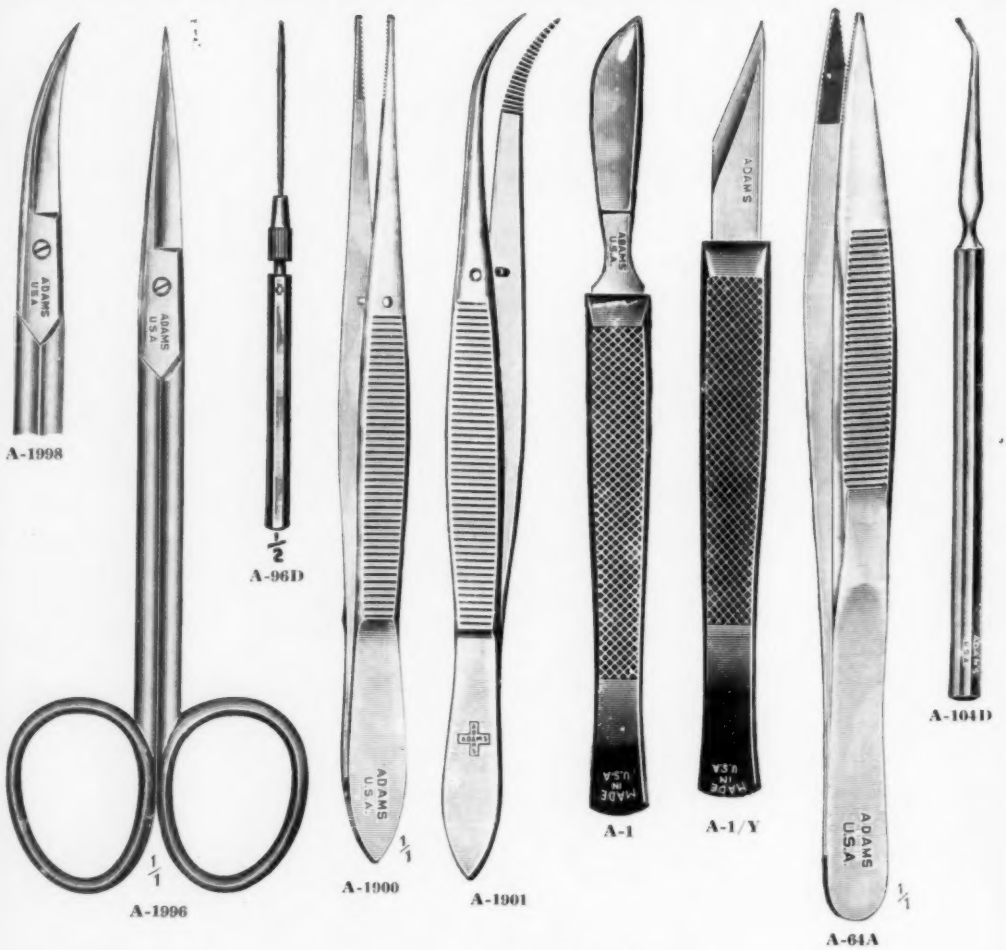

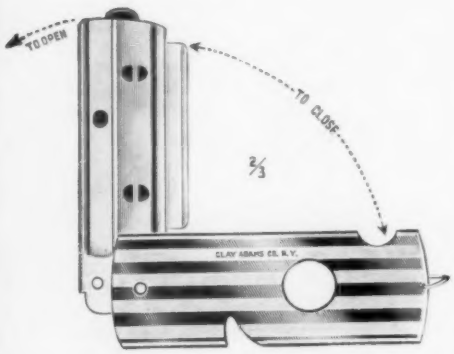

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The American Biology Teacher

Vol. 1 DECEMBER, 1938 No. 3

1. Drosophila in the Laboratory

DR. CATHERINE V. BEERS
University of Southern California

The little yeast fly, Drosophila, is a constant contributor to our knowledge of heredity and evolution. Its life cycle is relatively short, ten days to a month or so, and then the flies are ready to start the next generation in a few hours to a few days. Even the longest life cycle of the Drosophilas is short in comparison with that of the animals and plants of the farm or experiment station.

One pair of Drosophilas can raise one, two, or even three or four hundred offspring in one half pint milk bottle and many half pint milk bottles can be stored on a laboratory shelf. The food problem is solved with cornmeal, molasses, yeast, and agar to make it firm. Paper towelling absorbs excess moisture and provides a place for pupation. Flies undergo complete metamorphosis, which means that out of the egg hatches the very tiny larva which eats ravenously and grows so fast that the small jaws are moulted and replaced by larger ones. At the end of the larval stage the little white maggot crawls up out of the food onto the paper or side of the bottle and constructs its pupa case. In due course of time the imago or adult emerges from the pupa case and is ready very soon to mate and start another generation of flies. These small flies are frequently around fermenting fruit, not because they are the "Mediterranean Fruit Fly" but because they are hunting the yeast food for the larva. The yeast may be the wild yeast always floating in the air or it may be the yeast planted by the hopeful collector in the fly trap bottles.

There are many species of Drosophila (Sturtevant, Carnegie Institute of Washington Publication No. 301) but my particular pet has been a little black fellow with two sex combs on the tarsus of the prothoracic leg of the male. Dr. Metz and Dr. Lancefield started work on it when it was called Drosophila obscura but it was later shown that Drosophila obscura was the Euuropean form so D. pseudoobscura became the name of the American form. Among the stocks he collected in nature, Dr. Lancefield found that certain crosses would not produce grandchildren (F2). Each female col-

lected in nature, has probably mated with one or more males so each female is placed in a bottle and is used as the parent of a strain or stock. Dr. Lancefield found that all the strains when crossed would produce children (F1) but that in only certain crosses would the hybrids when mated among themselves produce offspring (F2). His original stocks he called race A and the new stocks which, when mated with race A, did not produce grandchildren, he called race B. Race A and race B are alike to the taxonomic entomolygist, but to the geneticist they are physiologically different. The hybrid (race A × race B) females are partially fertile but the hybrid males are sterile. Therefore, hybrid males and hybrid females do not produce offspring but the hybrid females can be backcrossed to males of either race. On the basis of the classical idea of a species—that two species will not produce fertile hybrids—these two races A and B might be called physiological species, or species "in the making." The hybrid females are partially fertile but the hybrid males are sterile.

In order to make comparisons there must be differences. To the systematic entomologist there are no specific differences between races A and B, but to the geneticist there is a physiological difference and to the cytogeneticist there is a difference in the appearance of the Y chromosomes. Drosophila pseudoobscura found in nature is black in color, has rather dark red eyes, long bristles regularly arranged on head and thorax, long wings with uniform edges and a definite pattern of wing veins. Many mutant characters were known in Lancefield's race A but few in race B. Singed bristles and bubble wing were the only two available so I undertook to secure new mutants in race B.

The term mutation as first used by deVries indicates a sudden change that is inherited. These mutations occur occasionally in nature and deVries found them in the evening primrose, Oenothera. Some animals and plants seem to mutate more frequently than others. Treatment with X-rays, radium, heat and certain chemicals speeds up the process. Race B flies were subjected to X-rays and mutant forms appeared in the offspring of treated flies as well as in the untreated stocks. Some of the new characters are eye colors or even the complete absence of eyes.

In systematic entomology a fly without eyes and a fly with eyes would certainly not be classified in the same species. Yet in a stock of red-eyed flies a mutation occurred and an eyeless mutant appeared which is entirely fertile with the original stock.

Because race A and race B will produce offspring it is possible to test the mutants directly by breeding. For instance when a bright red "vermilion" eye color appeared in race B it could be mated with "vermilion" in race A and when all the offspring had bright red eyes it was concluded that the "vermilion" of race B is an allele of "vermilion" of race A. Another bright red eye color in race B was crossed with "vermilion" but the offspring did not have bright red eyes but the darker red typical of the wild type flies. Therefore, the second bright red was not called "vermilion" but "scarlet." Eye colors may appear similar but may be different in their breeding reactions. Such is the case of "scarlet" and "vermilion." To date "scarlet" is known in race B but not in race A. White eye color has been found in both races and when white flies of the two races are crossed the offspring are all white eyed. But if white is crossed with scarlet the hybrid eye color

is neither white nor scarlet but is the red of the wild type eye found in nature.

By direct mating tests the mutants in race B, white, singed (bristles), vermilion, compressed (eyes usually entirely absent), sepia and shortest (veins shorter in the males than in the females were shown to be allels of white-eosin, singed, vermilion, compressed, sepia and short of race A). When mutants are not available for direct tests there may be other evidence that suggests allelism. For instance, the linkage data for scutellar of race A indicates the locus to be approximately the same as for the present scutellar of race B. The bright red eye color which gave recombination percentages with sepia and compressed to place it between the two was named scarlet for another reason. Sturtevant, Tan and Donald have pointed out homologies between the chromosomes of D. melanogaster and D. pseudoobscura. The left arm of the V-shaped X chromosome of pseudoobscura is homologous with the X chromosome of melanogaster because they both contain the loci of white, vermilion and the other sexlinked mutants of melanogaster. The right limb contains short and sepia which are similar to those in the left limb of the IIIrd chromosome of melanogaster. Therefore, when the bright red eye color mutant is located in the arm with sepia it is desirable to give it the name already used in melanogaster, that is "scarlet."

These visible mutants are very useful in experimental breeding as markers for chromosomes that can be seen only in prepared dead material. Dobzhansky and Tan have shown that there are several genes or determiners which cause the hybrid sterility in the AB crosses and that these sterility genes are distributed at different regions on the chromosomes. Dobzhansky has collected in nature another fly, D. miranda, that is similar in appearance but somewhat larger than D. pseudoobscura. Neither male nor female hybrids between these two species are fertile. This lack of fertility has also been shown to be due to sterility genes.

Since Painter's study in 1934 of the chromosomes of the salivary glands of the larva of Drosophila melanogaster, Tan and Dobzhansky have compared the maps of the two races of D. pseudoobscura and D. miranda. The cells of the salivary glands increase in size and the chromosomes are in what is known as the permanent spireme stage. They are paired, wide, long chromosomes with diagnostic cross bands. The spindle fiber ends of each pair of chromosomes are located in a chromocenter which has few if any bands. In the larvae of hybrid flies the chromosomes do not pair and often it can be seen that the sequence of bands is not identical. This condition gives evidence that the gene arrangements in the two parent types is not the same. By using the salivary gland chromosomes of melanogaster, Bridges was able to show that the Bar "gene" is a duplication of certain bands and in the case of "notopleural" Bridges, Skoog and Li showed that there is a deficiency of 50 recognized bands.

To make a detailed study and to be able to demonstrate the absence or duplication of a few bands requires the technical skill of a specialist but it is not difficult to make preparations to show the banding of the salivary gland chromosomes. Place one pair of flies in a half pint milk bottle and allow the larvae to grow at about 19° C. Add extra yeast two or three times during the larval period. The larvae should grow large and may be removed when they come out to pupate. Chill the larvae in isotonic salt ice water. Dissect out the salivary

glands, fix, and stain in acetocarmine. The nuclei of the cells can be seen under low power and by gentle pressing the nuclear wall can be broken and the chromosomes can be stretched. The bands can be seen easily under the 16 mm. high power objective lens. Of course, more details can be observed in proportion to the definition of lenses, lighting, filter, and stain.

All this study of the flies has cleared the way for an interpretation of human heredity. Of course, it is impossible to breed men and women as we breed flies but each marriage is an experiment and each offspring gives information as to the genetic constitution of its parents. For instance, it is found that hemophilia or bleeding is more prevalent in certain families than in others. If a man is a bleeder and he marries a woman of normal ancestry none of his children will be bleeders but if his daughters have sons, 50 per cent of those sons will be afflicted with hemophilia. Such a condition was puzzling until Morgan's white-eyed fly explained sexlinkage. The white-eyed male mated to a red-eyed female never has white-eyed offspring, nor does his red-eyed sons have white-eyed offspring. But his red-eyed daughters when mated to red-eyed males produce half of their sons with white eyes, and the other half with red eyes. The determiner or gene for white eye is carried in the X chromosome and the male has only one X chromosome. If he has a gene for white eye it will be expressed and passed on to each of his daughters but if, on the other hand, he has the gene, element, for red eye, he will never be white eyed nor will he have any element for white eye to contribute to his offspring. The female, however, has two X chromosomes, each of which may contain an element for red eye or an element for white eye. A female may carry a gene for red eye, in one X chromosome and a gene for white in the other X chromosome. One element for white does not express itself in the female when the determiner for red is also present so that female may carry a determiner for white without showing it until it expresses itself in half of her sons. This sexlinked inheritance of white eye in the fly explains the inheritance of hemophilia in the human. The woman may carry the determiner and transmit it without being herself a bleeder. Such was probably the case with Queen Victoria. However, Dr. Bird has shown that the female hormone is present in reduced amounts in a female carrier but evidently there is an amount sufficient to prevent bleeding. On this theory Dr. Bird introduced the female hormone into an hemophilic man after an operation and the bleeding did stop. Of course, such treatment is a temporary control and does not affect the gene, its inheritance or its expression in later generations of offspring. Hemophilia is only one of the conditions known to medical science whose inheritance has been explained by experimental work with the flies. I will discuss only one other fly character—abnormal abdomen. The dark bands on the abdomen of the fly are usually uniform across the back. A pair of flies with abnormal banding will have offspring that are normal if they are raised in a good moist food culture, on the other hand, if the offspring are raised in old, drying food the abnormal abdomen is very evident. The fact that the determiners for abnormal abdomen do not express the character under the influence of moist environmental conditions and do express it when the food is dry emphasizes another important point in this problem of heredity, namely, the characteristic is the expression of the hereditary genes developing in a given en-

vironment. Heredity and environment are both essential in the development of any individual be it man or fly.

To sum up: the Drosophiline flies are very useful in any zoölogical laboratory to illustrate the following points:

1. The characteristics of the Arthropoda; jointed appendages.
2. The characteristics of the Insecta; three body parts, three pairs of legs and a pair of antennae.
3. The characteristics of the Diptera; two wings (one pair).
4. The life history of an insect with complete metamorphosis; egg, larva, pupa, imago, (adult).
5. Characteristics usually found in nature vs. mutant characters.
6. The inheritance of mutants by actual breeding experiments.
7. The influence of the environment on the expression of the genes.
8. The study of the chromosomes of the salivary glands; the bands in relation to pairing and nonpairing.

The Carnegie Institution of Washington maintains a "Drosophila Information Service" for all laboratories where research work is being done on any of the Drosophiline flies. It is issued by Dr. M. Demerec at Cold Spring Harbor, Long Island, and Dr. C. B. Bridges at the California Institute of Technology in Pasadena.

Formative Teaching

GUY F. WILLIAMS
Department of Science, Colby Junior College

George Herbert Palmer, Professor of Philosophy at Harvard wrote in 1908, in an address to teachers, these words, "The touch of the teacher like that of no other person is formative." That statement is equally true today and more so for science teachers because of this unparalleled age of science.

As I look back over the days when I was being exposed to that formative training from rural school to graduate work I conclude that it was characteristics of my instructors that enabled them to exercise aptitudes in effort and personality that had formative effects on me.

I will consider three such aptitudes here, namely—

1. The aptitude to put oneself in the place of his pupils.
2. The aptitude to accumulate and use a wealth of interesting knowledge.
3. The aptitude for a reasonable possession and a gracious acknowledgment of other fields of learning.

To put oneself in the place of his pupils:—Too often a fund of information is gathered and presented in the language of one having had college and graduate work, or in the language of the doctor, who may have written the particular reference used for priming. It is true, an instructor may, as a rule tell by watching his class whether he is getting the desired things across, or he may check by quiz or examination, and later represent, if necessary. But the real opportunity for contagion in the science classroom is in the initial presentation, and more happy is the teacher who may have seen the idea in the conception and language of his pupils first.

I have seen biology classes confused and discouraged by having such a state-

ment as "The Plant Kingdom is made up of thallophytes, bryophytes, pteridophytes and spermatophytes" presented to them abruptly. Right at the start there are four things to think about each clothed in unheard of terms. How much better to have presented one at a time and in the language of the boys and girls first. If a minister should start his sermon with a strong sentence suggesting four comparably difficult things to be grasped and carried through his discourse, what would be said about him afterwards? Put "In loco discipuli" in place of "In loco parentis," and meet modern youth, who really wants to know, in the form of an effective salesman. And from the pupils' point of view place openly and concretely before them the fundamental learning objective of the day.

Next, science teaching offers the richest kind of place for the aptitude to accumulate a vast wealth of interesting facts and illustrations and correlate them so to start pupils on the road of curiosity with a thirst to know things, and to help young people find themselves in relation to their surroundings.

The alert science teacher is always on the watch for interesting facts and events and considers it not a burden but a pleasure to spend a little time each day and week, in schoolyear or vacation to collect and add to his already stored wealth. The anticipation of the effects it will have on his classes is reward enough. Such an aptitude will break the dryness of sections of textbooks and be an oasis for boys and girls, and may bear fruit, to the extent of developing hobbies and interests of inestimable value through the teen age and ripen into a lifelong habit of reading and enjoying science. Teachers should remember that they are not teaching boys and girls through four years of high school but are teaching and molding for a life of citizenship. Boys and girls have much more respect for those instructors who have facts to give not mentioned in the text and correlations to awaken minds and appreciations. Books cannot be written that will hold everything that should be thrown into a year's course. Authors cannot take time and space to correlate at all opportunities. The time, the place and the situation should determine what is added for supplementary teaching and the instructor with an enriched store of information is the one who will have the day. To many young people our textbooks are not interesting, many of them are written and chosen from the point of view of the writer and teacher only.

My third is the aptitude for a reasonable possession and sympathy in other fields of learning. In the search for truth the philosopher says—

"Two kinds of things there seem to be,
The whole is relativity."

Science teachers are instructing boys and girls who will enjoy life pretty much to the extent that their school days helped them feel the relativity of the art, the music, the science, the literature that make life pleasant through peace of mind.

The writer is sure "The Chambered Nautilus" and "The Waterfowl" never would have meant so much to him had they not been woven into the classroom in biology and interpreted by a teacher of rare ability, who was a character builder by forgetting himself and carrying his pupils through wonders of life today, quoting Tennyson tomorrow and delving in the Book of Books on the next day. When his pupils left his classroom they were bigger in more ways than a knowledge of biology. The writer would have science teachers possess a broad background of the liberal arts.

Pedagogia

Abstracts from the Literature

T. F. MORRISON

COCKERELL, T. D. A., *Visual Education and Nature Study.* School and Society, 48: 464–465; Oct. 8, 1938.

Methods employed in visual education can be used with great success in the study of plants and animals in the field. Parts of the ever-changing panorama of nature can be crystallized by the use of drawings and photography, both "stills" and "movies." One of the inherent dangers in all work of this type is the lack of imagination on the part of the worker. A considerable amount of this necessary ingredient is essential lest the results be too stereotyped to arouse student interest.

EASTER, SISTER M. CLARETTA, *Botany in a Small High School with Access to the Country.* School Science and Mathematics, 38: 775–784; Oct., 1938.

The Author urges that more time be spent in the field, "a boundless laboratory" for the biology classes. At the Aquin High School, Freeport, Ill., she has developed a botany course based on the natural cycle of plants. There is a description of the more unusual aspects of the work and methods employed in this very interesting experiment in teaching.

QUAINTANCE, C. W., *Should We have National Textbooks on Conservation Teaching?* School Science and Mathematics, 38: 789–795; Oct., 1938.

The Author questions the advisability of Mr. "Ding" Darling's suggestion that the sum of $30,000 be allocated to the development of national texts on conservation. He points out that such texts might be too local in nature to be of wide-spread use since conditions in one locality might differ radically from those in another. This would result in a bias for, or against, particular forms and might form the basis for harmful propaganda. As an alternative to Mr. Darling's suggestion, Mr. Quaintance offers the one that this amount be spent locally to further programs now definitely under way and proving themselves of value.

WEBB, H. A., *The High School Science Library for 1937–1938.* Peabody Journal of Education, 16: 121–138; Sep., 1938.

This excellent list appears now in its fourteenth edition. As usual, Dr. Webb has listed current science books with a brief annotation on each. The books are grouped by subjects as well as by price. A copy of the list may be obtained by addressing the Author, George Peabody Teachers College, Nashville, Tenn., and the price is very modest. Your Reviewer believes that this list is invaluable for those interested in building a library on books on biology.

POWER, C. E., *Current Answers to the Question: "What Should the Teacher of Science Know?"* School Science and Mathematics, 38: 757–762; Oct., 1938.

In keeping with the modern trends of education, the teacher of Science should bring to his classes more than a mere factual knowledge of his field. He should bring a background of knowledge which will integrate his subject with the problems the student is going to face in later life. Citing several recent works on science education, the Author discusses briefly the type of education needed by a teacher to put himself in rapport with the present-day movement.

Editorial Comment

Let's Get Together

A well-known school administrator once remarked: "You Biology teachers try to cover too much ground, as a consequence you don't teach anything thoroughly. Some of you think that community hygiene and personal hygiene are the most important; others want to stress nature study and the identification of a large number of common plants and animals; still others think that training in technical detail has the most lasting results. You can't do everything well in one short school year. Why don't you get together?"

A glance through the latest and most popular text-books tends to confirm this man's opinion. Some books fill many pages with accounts of the interesting things to be seen out-of-doors, and give almost no space to structure and function. A few are merely simplified college texts.

Is this a healthy condition for the secondary field of biology as a whole? Some educational leaders have doubts, and, as a result, many excellent studies have been made. By and large, these studies have one serious fault—they are frequently not written by teachers of secondary school biology.

Secondary school biology teachers have the talent and ability to work out their own destiny. They are the logical ones to decide just what fundamentals should be in every biology course; just how much of the philosophy of biology can be taught effectively to tenth grade pupils; how best to appeal to the low IQ while holding on to the interest of the high IQ.

Will they do it?

PHILIP E. FOSS

FORUM?

The writer has the feeling that there should be a column in *The American Biology Teacher* devoted to the exchange of experiences and opinions of classroom teachers of Biology. This column might well be based on the actual experiences of teachers of Biology primarily, however, an exchange of opinions and ideas are often of value to teachers engaged in the same work. Here might be a medium for such exchanges on the success or failure of certain procedures or techniques often employed in the Biology classroom, or pros and cons on controversial subjects of interest to Biology teachers. Some suggested topics are:

1. The double laboratory period.
2. Methods of conducting the laboratory, handling note-books, use of laboratory manuals, etc.
3. Field excursions.
4. Do we attempt to teach too much? (Cover too much ground.)

This column might also afford a means for the inexperienced teacher (as well as experienced ones), to obtain answers to their teaching problems.

For example, the writer, several years ago dropped the double laboratory plan and adopted the single laboratory period in its stead. Under the single laboratory plan, individual work on the part of the student has been reduced to a minimum, and the discussion-demonstration-individual laboratory plan has been substituted. Furthermore, there is no definite time indicated in the schedule as to when such periods are to be given. These periods are given whenever and as often as is deemed necessary. This change has resulted in an increased enrollment in

(Continued on page 59)

News and Notes

THE RICHMOND MEETING OF THE NATIONAL ASSOCIATION

Plans are complete for the Richmond, Virginia, meeting during the holidays. Members of the National Association of Biology Teachers attending the A.A.A.S. will have the opportunity to become acquainted with the organization. Headquarters will be established, a program for members arranged and a dinner provided. All in true convention style.

The WILLIAM BYRD HOTEL will be headquarters for the NABT. Here a room or suite will be at your disposal. It will be reserved for your convenience. It will serve as a clearing house for members, where friends may meet, local hotel addresses of friends found and excellent accommodations for loafing provided. It will serve as a clearing house for messages or mail or other personal service. Registration will be maintained on Tuesday and Wednesday. Tickets for the joint dinner may also be purchased here. Detailed information regarding the NABT can also be obtained and details of the program found.

The program for the two days is:

TUESDAY,
DECEMBER 27, 1938

2:00– 4:30 PM. Executive committee meeting.

WEDNESDAY,
DECEMBER 28, 1938

9:30–11:30 AM. Program for members.

2:00– 4:30 PM. Program for members.

6:30– 8:15 PM. Joint Dinner.

The joint dinner will be with our sponsors THE COMMITTEE ON BIOLOGICAL SCIENCE TEACHING of the Union of American Biological Societies. We are the brain child so to speak of this group. Let us give them our support by turning out to greet them. All members of the National Association, their friends and members of the executive committee are invited to attend. Dinner reservations may be purchased beforehand by writing Secretary Houdek, of Robinson, Illinois, or at the registration desk of the NABT headquarters.

M. C. LICHTENWALTER

Mr. I. P. Daniel, chairman of the program committee of the Chicago Biology Round Table, will have his spring program of meetings for the January issue. Mr. Daniel is vice-president of the Round Table and in June he completed a course of study for biology in the High Schools of Chicago.

"Grape Vine" communication has reached the office of the president that there is a new local group being formed in the Los Angeles area. A new Biology Teachers Association chapter is encouraging. The National should be proud of this group. Your president having spent one year of elementary school in this area and a year of graduate study in the same region feels certain there will be an active association formed.

Mr. P. K. Houdek presented his report on November fourth to the Illinois Biological Association regarding the organization meeting, in New York in July. There was a combined drive for memberships into the National group at the same time. The results were highly successful. Mr. Houdek is our national secretary-treasurer and past president of the Illinois group.

Grace L. Cook, president of the Illinois Biological Association, had a student project display for a part of her program. This display was in the form of an exhibit. The innovation proved quite successful.

Dr. E. E. Sherff of the Chicago Normal College presented the official report of the organization meeting to the Chicago Biology Round Table. This was on November eighteenth; previous conflicts prevented Dr. Sherff from making a report at either of the other two fall meetings.

Mr. Malcom Campbell gave his report of the organization meeting at the New England Biology Association on October fifteenth. It was combined with a membership drive for the National Association. Mr. Campbell is president-elect of the National Association.

The Kansas Association is the tyro of biology teachers associations. However, on the fourth and fifth of November they proved their worth to the title of Biology Teachers Associations by putting on a membership drive for National Association of Biology Teachers. They remain neophytes no longer.

Our program called for eight sectional meetings. Each group holding its own program at its center. Individuals on the different programs speaking in behalf of the National Association, and local organizers for the membership drive were as follows:

At the Topeka meeting Mr. Homer Stephens appeared on the program. Mr. Stephens is from Atchinson. The Kansas City meeting had Miss Gladys Beck of Wyandotte High School as the representative. The Hays group was guided by Dr. L. D. Wooster of Fort Hays State Teachers College in its drive for members. The Wichita section had Dr. O. P. Dellinger of State Teachers College of Pittsburg. The Garden City regional had Mr. D. Bennett of the same city as representative.

The speaker for the Hutchinson meeting in behalf of the National Association was Mr. C. S. Wood of Pratt. The Salina group had the pleasure of listening to Dr. J. R. Wells of State Teachers College of Pittsburg present the advantages of the national membership. Dr. J. A. Trent of State Teachers College of Pittsburg presented the group at Pittsburg with a résumé of the organization meeting held in New York in July. He also headed the membership drive and spoke in behalf of the national. The Kansas group is a progressive organization, has a fine roster of officers behind it. They are to be congratulated.

Fall Meeting of the New England Biological Association.

The New England Biological Association held its first meeting of the school year on October 15th in the new High School at Fitchburg, Mass. The membership numbers 105 and the fact that over eighty were present testifies to the value which the meetings hold for the members.

As usual the program included the inspection of the science laboratories, which in this school are especially well equipped. The exhibits of biological equipment and materials were very complete and interesting. Ingenious methods of showing materials and neat cages and cases, easily and cheaply made, were especially suggestive. A very beautiful exhibit of fall fruits and flowers occupied a corridor show case.

The talks were of the usual high standard—interesting, practical, sugges-

tive and stimulating. Miss Helen Merriam of Fitchburg High School spoke on "The Use of Live Material and Visual Aids in a High School Biology Course." The address was richly illustrated with materials which Miss Merriam had collected and with very humorous and human accounts of the manner in which pupils, friends and neighbors contributed. A short question period, conducted by Mr. Warren Bartlett of Brookline High School followed. In the afternoon Mr. Alva Z. Allen of Milford, New Hampshire spoke on "Methods of Utilizing Current Biological Science in Teaching Biology." His method of building a file around his units and of giving credits for outside reading and of keeping records, was unique and helpful. Although he spoke especially from the viewpoint of the small high school, his methods could be easily adapted to a larger school. "The Place of Nature Education in a High School Biology Course" was the subject of an informal talk by Dr. William Vinal, Professor of Education at Mass. State College, Amherst. Dr. Vinal called attention to trends which must influence the biology teaching of the future, especially the outdoor recreation centers opened by the C.C.C., which the public must be educated to use and care for wisely, and the city ownership of camps for all children who wish to attend them. He also emphasized the value of learning by doing, the use of materials and opportunities at hand and the possibilities of hand work with biological materials. His talk was challenging and suggestive. The high light of the business meeting was the report by Mr. Malcolm Campbell of the conference for the formation of the National Association of Biology Teachers, to which he went as a delegate last June. His report made it very clear that the new association will be of great value to all biology teachers and that each one has his responsibility and opportunity in helping its growth. Forty-five members joined the National Ass'n. at this meeting.

HARRIET FOGG, *Secretary*

FORUM?

(Continued from page 56)

Biology; as much subject matter has been covered, and apparently as thoroughly as formerly, as indicated by better grades, on the whole. It has also eliminated difficulties in scheduling students. The writer would appreciate knowing of the experiences of others on this subject.

Furthermore, the writer would like to read the successful experiences of others on "types of notebooks" students should keep; "to what extent should student be expected to make drawings"; and "how should notebooks be graded."

If such a column is to become a part of *The American Biology Teacher,* what name shall we give it? Send in your suggestions as well as your successful experiences on the above topics or others of equal importance to Biology teachers.

J. A. TRENT,
State Teachers College,
Pittsburg, Kansas

DUES NOW PAYABLE

Those who pledged their memberships through a local, state or regional organization may remit their dues of $1.00 through the national representative of their organization.

Any member may, if it is more convenient, remit their dues direct to the secretary-treasurer.

BOOKS

WALTER, HERBERT EUGENE. *Genetics.* New York: The MacMillan Co., 1938. 412 pp. $3.00.

Genetics is one of the youngest offsprings of the mother science of Biology. The science of genetics was begun by Gregor Mendel who conceived the brilliant idea of simplifying breeding experiments to the point where he was dealing with but one variable at a time. However Mendel's work attracted no attention worthy of note. His scientific papers (1865–1869) were published and forgotten. They were found again about 1900 when de Vries in Holland, Correns in Germany, and Tschermak in Austria rediscovered Mendel's laws, each working independently. The delay of thirty years in the progress of the study of heredity, due to the failure of Mendel's contemporaries to appreciate his contributions, is one of the great misfortunes of science. As a result the emergence of Genetics as a science was delayed until the present century.

One of the first (if not the first) books to bear the name Genetics was the great-grandfather of this book. It was published in 1913. A revised edition appeared in 1922, a third edition came along in 1930, and "now in 1938, as Dr. Walter humorously remarks, appears the fourth in line, a somewhat different young hopeful, still hearing the family name but looking back upon its underprivileged ancestors with something of the apologetic tolerance of youth."

Genetics may be defined as the science of heredity. The genes, the units of Genetics, are the smallest known living particles. The size of genes has been estimated to range between twenty and seventy millimicrons in diameter. A micron is one-millionth of a millimeter.

There are generally speaking, five avenues by which the study of Genetics is approached: the method of observation, the experimental method, the statistical method, the cytological avenue, and the developmental approach. Each of these primary ways of studying Genetics is given detailed consideration in this book.

This book also contains an excellent chapter of "Problems for Practice." Teachers who have had difficulty in finding or devising work exercises for their students in connection with the study of heredity will find this chapter stimulating and helpful.

The style of writing is clear and brilliant. This work is recommended as a worthwhile addition for the libraries of high school and college biology teachers.

ELWOOD D. HEISS

SPEMANN, HANS. *Embryonic Development and Induction.* Yale University Press. 1938. $5.00. 398 pages. Complete bibliography, Index of men quoted. 192 figures, including diagrams and microphotographs.

The basis of the text is the series of lectures of the Silliman Foundation at Yale University in 1936. The author reviews the work in development of the embryo by many experimenters, beginning with Roux and Driesch. He gives detailed accounts of his own experiments with constant reference to the work of other investigators. Some idea of the scope of the work can be shown by a partial list of the table of contents. This includes: Normal development of the Amphibian egg, Development of the vertebrate eye as an example of a composite organ, including methods of investigation, mutilation, and transplantation, Induction, Tests of potency of the

early gastrula, The organizer, Potency and determination, Abnormal inductors, Means of induction, Embryonic field, Gradient theory, Induction and the problem of "wholeness."

The author painstakingly relates details of experiments, evaluates these, indicates the uncertainties attending interpretation of their results, and draws conclusions with caution. He emphatically states that though he has used the term "organizer" to describe certain observable phenomena he is not ready to formulate any general organizer theory. He indicates how meager are fundamental conclusions about induction and development. Since so much experimentation is going on in this field he is willing to await more evidence before making sweeping generalizations. Particularly so because different organisms vary so widely in response to experimentation. A concluding remark may tend to keep existing controversies alive. Of his text he says, "Again and again terms have been used which point not to physical but to psychical analogies. This was meant to be more than a poetic metaphor. It is meant to express my conviction that the suitable reaction of a germ fragment, endowed with the most diverse potencies, in an embryonic "field," its behavior in a definite situation, is not a common chemical reaction, but that these processes of development, like all vital processes, are comparable, in the way they are connected, to nothing we know in such a degree as to those vital processes of which we have the most intimate knowledge, *viz.*, the psychical ones."

This noteworthy author presents here the most authentic information we have of experimental embryology.

LLOYD A. RIDER,
N. Y. C.

LEAKEY, L. S. B. *"Adam's Ancestors."* New York: Longmans, Green and Company, 1935. 244 pp. $3.00.

During the past decade we have witnessed a rapidly growing interest in scientific findings pertaining to the origin and evolution of man. In this book Dr. Leakey has brought together the latest discoveries concerning the Stone Age. An account of what is known at present about our ancient ancestors is presented.

In the first part of the book the author shows how the mind of a modern prehistorian works; how he obtains guidance for his choice of excavation sites by sound deductive reasoning; how by applying scientific methods to his labors in the field and by correlating items of knowledge he makes deductions from the records left by primitive man.

This book is an up-to-date outline of what is known about the origin of man. It is written, largely, in the evolutionary way by tracing man's development from early primitive cultures up to the present time. An excellent chapter, called Apes and Man, answers the questions so often propounded by the laymen as to whether man is descended from a monkey. The last chapter, What of the Future?, is thought-provoking.

The book is written for popular consumption and it should find a wide reading public. The author evinces no small degree of optimism, however, when he assumes that the average layman is already familiar with such words as Pleistocene and Pliocene.

ELWOOD D. HEISS

FOX, H. MUNRO. *Biology.* New York: MacMillan Company, 1932. 344 pp. $1.48.

This book was written by Professor Fox of the University of Birmingham, England and has obviously been prepared for use in schools of Great Britain.

This work is a decided contrast to biology books written by American authors. American biology textbooks, for the most part, are organized in one of two ways: (1) built around biological principles or (2) divided into three parts; a section of botany, a section of zoology, and a section of physiology.

It is difficult to find any logical scheme of organization or underlying philosophy for this book. This may be due to the fact that in Great Britain biology is not a well established subject in the curriculum. The author states that the "book has been written in part to conform with the requirements of the School Certificate Examination and of Biology as a subsidiary subject in the Higher Certificate."

According to American standards the book could hardly be said to be well illustrated. It has but 152 illustrations. These, however, are all of excellent quality.

The book is written in a clear and scholarly manner. Each chapter contains an excellent list of observation and laboratory exercises.

ELWOOD D. HEISS

SWINGLE, D. B. *Plant Life.* New York: D. Van Nostrand Company, 1935. 431 pp.

In most books pertaining to the plant kingdom there has been a tendency to approach the subject from the standpoint of morphology, the consideration of function being incidental or concomitant. This book is different and unique in that plant processes and plant activities furnish the themes around which the units are built.

This is not to imply that this book is deficient in plant anatomy but rather that morphology is considered as a means to an end rather than an end in itself. This is an advance in method of presentation and it is in line with the modern belief of science educators that introductory biology courses should be centered around principles and activities of living things rather than around a detailed study of anatomy.

This book is divided into eight parts or units. The following are themes around which the units are built and they are given in the same order as they appear in this work; (1) the living plant with special emphasis upon plant behavior, (2) plants and their surroundings, (3) plants and their food, (4) the growth of plants, (5) reproduction in plants, (6) the different kinds of plants, (7) plants, past and present, (8) the relation of plants to each other and to animals.

This book is recommended to be used as a basic textbook in one semester introductory college botany courses. It is clearly written and less technical than many college botanies. It should prove a valuable reference book for high school biology classes.

ELWOOD D. HEISS

Suggestions and criticisms for the improvement of THE AMERICAN BIOLOGY TEACHER to meet the needs of readers more adequately are always welcome. Your cooperation is essential for the fullest realization of the objectives of this periodical.

EDITOR.

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